Ch. 7 review- After AP test NAME: Key

1. Polychlorinated biphenyl (PCB) contamination of a river by a manufacturer is being measured by amounts of the pollutant found in fish. A company scientist claims that the fish contain only 5 parts per million, but an investigator believes the figure is higher. Six fish are caught and show the following amounts of PCB (in parts per million): 6.8, 5.6, 5.2, 4.7, 6.3, and 5.4, respectively. These 6 fish were an SRS from a known normal population.

Assump	Check
1. SRS	1. ~~assumed~~ circled
2. norm pop or $n \geq 30$	2. circled

   a. Conduct a full test of significance at the .01 level of significance

$H_0: \mu = 5$

$H_a: \mu > 5$

$$t = \frac{\bar{x} - \mu}{s/\sqrt{n}} = 2.139$$

$P(t > 2.139 \mid df = 5) = 0.0427$

- fail to reject Ho b/c p-value > $\alpha = 0.01$
- suff. evid that avg PCB contamination is equal to 5 ppm.

   b. Estimate the mean contamination level with a 95% confidence interval, and interpret your results.

$$\bar{x} \pm t^* \cdot s/\sqrt{n} = (4.8656, 6.4677)$$

We are 95% conf. that the avg. contamination level is btw. 4.8656 + 6.4677 ppm.

2. What is the critical value for a 99% confidence interval on a sample size of 15? (use table)

$$t^* = 2.977$$

3. An accounting firm measured the blood pressures of ten of its certified public accountants (CPAs) before and during the spring 1996 tax season. The systolic pressures for the ten individuals designated as A through J appear in the table below. These samples are known to be simple random samples, and it is known that the distribution of all blood pressures for certified public accountants is normal. Do blood pressures **increase** during tax season?

	A	B	C	D	E	F	G	H	I	J
L_1 **Before**	110	124	98	105	115	120	118	110	123	95
L_2 **During**	115	126	97	108	115	124	119	113	121	96

$L_3 = L_2 - L_1$

a. State the hypotheses.

$H_o: \mu_d = 0$

$H_a: \mu_d > 0$

b. Is there sufficient evidence at the 0.10 significance level to say that blood pressures have risen? Perform a full test of significance.

df = 9

$t = \frac{\bar{x} - \mu}{s/\sqrt{n}} = 2.278$

Assump
1. SRS — 1. circled
2. norm pp of diff. or $n \geq 30$ — 2. circled

$P(t > 2.278 \mid df = 9) = 0.024$

- reject Ho b/c p-value < $\alpha = 0.10$

We have sufficient evidence that blood pressure ↑ during tax season.

c. Calculate and interpret a 96% confidence interval for the mean difference in blood pressure.

$\bar{x} \pm t^* \cdot s/\sqrt{n} = (-0.0846, 3.2846)$

We are 96% conf. that the mean diff. in b.p. is btw -0.0846 and 3.2846 units.

* same assump & df.

4. A survey is run to determine the difference in the cost of groceries in suburban stores versus inner city stores. A pre-selected group of items is purchased in a random sample of 45 suburban and 35 inner city stores.

Suburban	**Inner City**
$n = 45$	$n = 35$
$\bar{x} = \$36.52$	$\bar{x} = \$39.40$
$s = \$1.10$	$s = \$1.23$

a. Is the average amount spent on groceries in the inner city significantly higher than that spent in the suburbs? Use a 0.05 level of significance to make your conclusion.

$H_0: \mu_S = \mu_I$

$H_a: \mu_S < \mu_I$

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}} = -10.876$$

Assump	Check
1. 2 ind SRS	1. circled
2. 2 norm pop or $n_1, n_2 \geq 30$	2. $n_1 = 45$, $n_2 = 35$ ≥ 30 ✓

$P(t < -10.876 \mid df = 68.865) = 0$

We reject Ho b/c p-value $< \alpha = 0.05$. We have sufficient evidence mean \$ suburbs < mean \$ innercity.

b. Estimate with 92% confidence the difference between the average amount spent on groceries in the inner city and the suburbs.

$$(\bar{X}_1 - \bar{X}_2) \pm t^* \sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}} = (-3.351, -2.409)$$

We are 92% conf. that the diff. btw. the mean suburb & mean inner city is btw. \$ 3.35 and \$ 2.41

* same assump. & df.